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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/464,322 12/15/99 KWON

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EXAMINER

MM91/0403

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ART UNIT

PAPER NUMBER

2815

DATE MAILED:

04/03/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/464,322

Applicant(s)

KWON ET AL.

Examiner

Chris C. Chu

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 - 20 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1 - 20 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claims ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 December 1999 is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____
- 18) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: _____

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "14" has been used to designate both adhesion layer and the metal layer. Correction is required.
2. The drawings are objected to because it is not clear to the examiner which part of Fig. 1 is being enlarged. Correction is required.

Specification

3. The disclosure is objected to because of the following informalities:
 - a. Reference number 42 in Fig. 1 is not described in the specification.
 - b. Reference numbers 61, and 62 in Fig. 3 are not described in the specification.
 - c. On page 3, line 25 of the specification, "surface of chip" should be --surface of the chip--.

Appropriate correction is required.

4. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: on page 6, line 5 of the specification, "the metal layer" lacks proper antecedent basis in the instant specification.

Claim Objections

5. Claims 1, 11, and 14 are objected to because of the following informalities:
- a. Claim 1, line 7, "semiconductor chip.." should be --semiconductor chip--.
 - b. Claim 11, line 3, "an adhesive.." should be --an adhesive--.
 - c. Claim 14, second from the last line, "o" should be --of--.
 - d. Claim 6, line 2, "lager" is an incorrect spelling.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 3 and 15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 3, it can not be determined where the metal layer formed "thereon for strengthening the adhesion between the semiconductor chip and the metal film," because the recitation of "the adhesion" and "the metal film" in the last two lines of the claim, lack proper antecedent basis.

Regarding claim 15, "filling a space between the semiconductor chip and the substrate" in the lines 1 and 2 of the claim, appears to be incomplete claim because it fails to define what is to fill the space, which renders the claim indefinite.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1, 3, 6, 8, 9, 11, 14, 15, 16, 17, and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Itoh et al.

Note Fig. 5, which shows a semiconductor chip package comprising a substrate (52₂) having a plurality of bonding pads; a semiconductor chip (54) having a plurality of conductive bumps; a heat slug (51) bonded to a backside of the semiconductor chip; and a solder film (56) that bonds the heat slug to the backside of the semiconductor chip.

Regarding claim 3, Itoh et al. discloses that the backside of the semiconductor chip includes a metal layer (55 in the Fig. 5).

Regarding claim 6, the Fig. 5 clearly shows that the solder film (56) has a size equal to or larger than a size of the semiconductor chip (54).

Regarding claim 8, Itoh et al. discloses that the heat slug comprises an adhesion layer (column 7, lines 14 – 15) formed on a surface of the heat slug that contacts the solder film (column 10, lines 28 - 31).

Regarding claim 9, Itoh et al. discloses that the adhesion layer is a layer selected from a group consisting of a Ni/Au layer, a Ag layer, and a Pd layer (column 8, lines 43 – 44).

Regarding claim 11, see Fig. 5, which clearly shows that a portion of the heat slug (51) is attached to the substrate (52z).

Regarding claim 14, Itoh et al. discloses a “method of fabricating a semiconductor chip package” by preparing the semiconductor chip (54 in Fig. 5) having a plurality of conductive bumps on a front surface of the semiconductor chip; bonding a heat slug (51 in Fig. 5) on a backside of the semiconductor chip using a solder film (56 in Fig. 5); and attaching the semiconductor chip on a substrate (52z in Fig. 5).

Regarding claim 15, in Fig. 5, which clearly shows that filling a space between the semiconductor chip and the substrate.

Regarding claim 16, in Fig. 5, which shows a semiconductor chip package comprising a substrate (52z) having a plurality of bonding pads; a semiconductor chip (54) having a plurality of conductive bumps; a heat slug (51) bonded to a backside of the semiconductor chip, the heat slug comprising a top portion, side standing portions bent from the top portion, and side end portions (see 51 in Fig. 5); and a solder film (56) that bonds the heat slug to the backside of the semiconductor chip.

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Regarding claim 17, the Fig. 5 clearly shows that the solder film (56) has a size equal to or larger than a size of the semiconductor chip (54).

Regarding claim 19, Itoh et al. discloses that the heat slug comprises an adhesion layer formed on a surface of the heat slug that contacts the solder film (column 7, lines 14 – 15 and column 10, lines 28 - 31).

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 2 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al. in view of Haley.

Itoh et al. discloses the claimed invention except that the material of the solder film, which includes one selected from “a group consisting of Pb, Sn, Ag, In, and Bi.” However, Haley discloses the material of the solder film (column 3, lines 66 –67). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Itoh et al. by selecting from a group consisting of Pb, Sn, Ag, In, and Bi for the material of the solder film as taught by Haley. The ordinary artisan would have been motivated to modify Itoh et al. in the manner described above for at least the purpose of increasing the bond strength between the semiconductor chip and the heat slug.

Regarding claim 13, Itoh et al. discloses the claimed invention except that a plurality of “throughholes” on the heat slugs. However, Haley discloses the plurality of “throughholes” on the heat slugs (108 and 109 in Fig. 1). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Itoh et al. by adding the plurality of “throughholes” on the heat slugs as taught by Haley. The ordinary artisan would have been motivated to modify Itoh et al. in the manner described above for at least the purpose of decreasing moisture inside of the package.

12. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al. in view of Furukawa et al.

Itoh et al. discloses the claimed invention except that the material of the metal layer, which includes one selected from “a group consisting of VN_i/Au, Ti/VN_i/Au, Cr/Vn_i/Au, Ti/Pt/Au, and etc.” However, Furukawa et al. discloses the material of the metal layer (column 9, lines 63 –64). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Itoh et al. by selecting from a group consisting of VN_i/Au, Ti/VN_i/Au, Cr/Vn_i/Au, Ti/Pt/Au, and etc for the material of the metal layer as taught by Furukawa et al. The ordinary artisan would have been motivated to modify Itoh et al. in the manner described above for at least the purpose of increasing the bond strength between the semiconductor chip and the solder film.

13. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al. in view of Maheshwari et al.

Itoh et al. discloses the claimed invention except that an underfilling material to fill a space between the semiconductor chip and the substrate. However, Fig. 2 of Maheshwari et al. clearly shows that an underfilling material is filled between the semiconductor chip and the substrate. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Itoh et al. by adding the underfilling material between the semiconductor chip and the substrate as taught by Maheshwari et al. The ordinary artisan would have been motivated to modify Itoh et al. in the manner described above for at least the purpose of preventing the cracking of the conductive bumps.

14. Claims 7 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al. in view of Takahama et al.

Itoh et al. discloses the claimed invention except that the heat slug is formed of a material selected from a group consisting of Cu, Al, and CuW. However, Takahama et al. discloses that the material of the heat slug (column 6, lines 38 – 39). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Itoh et al. by selecting from a group consisting as of Cu, Al, and CuW as taught by Takahama et al. The ordinary artisan would have been motivated to modify Itoh et al. in the manner described above for at least the purpose of improving heat dissipation.

15. Claims 10 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al. in view of Jeong et al.

Itoh et al. discloses the claimed invention except that the heat slug is coated with an anodizing layer. However, Jeong et al. discloses that the anodizing layer (73a in Fig. 6 and column 8, lines 3 - 4). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Itoh et al. by adding the anodizing layer as taught by Jeong et al. The ordinary artisan would have been motivated to modify Itoh et al. in the manner described above for at least the purpose of increasing the corrosion resistant and electrical insulation.

16. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh et al.

Itoh et al. discloses the claimed invention except that the adhesive includes silicon rubber or elastomer. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to using silicon rubber or elastomer material for the adhesive, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. The ordinary artisan would have been motivated to modify Itoh et al. in the manner described above for at least the purpose of increasing the bond strength between the heat slug and the substrate. In re Leshin, 125 USPQ 416.

Conclusion

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Wang et al. and barrow disclose the semiconductor chip package containing a heat slug.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chris C. Chu whose telephone number is (703) 305-6194. The examiner can normally be reached on M-F (8:30 - 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (703) 308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7382 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Chris C. Chu
Examiner
Art Unit 2815

c.c.
March 29, 2001



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